



### **In-Hospital Mortality From Acute Myocardial Infarction In Montana, 2000-2008<sup>1</sup>**

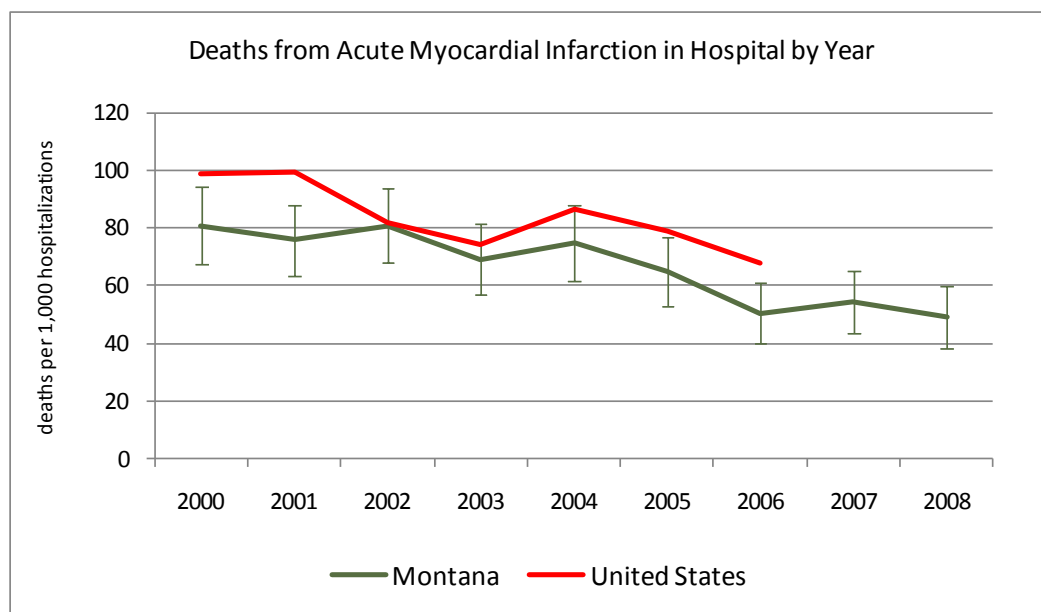
Cody Custis, MS, Epidemiologist, MHDDS

Carol Ballew, PhD, Lead Epidemiologist / Program Manager, MHDDS

Mike McNamara, MS, Secondary Prevention Specialist, Montana Cardiovascular Health

Mark Niebylski, PhD, MBA, MS, Section Supervisor Montana Cardiovascular Health

Cardiovascular diseases are the leading cause of death in Montana and the United States.<sup>2</sup> Prompt, aggressive treatment of acute myocardial infarction (MI, ICD-9-CM<sup>3</sup> code 410), such as percutaneous coronary intervention (PCI) and administration of fibrinolytic drugs, is an important benchmark of quality of care and has resulted in a national decrease in in-hospital mortality rates from acute MI per 1,000 admissions.<sup>4,5</sup> Montana exhibits a similar trend of declining in-hospital mortality rates for acute MI and in fact Montana's rates have been statistically significantly lower than national rates in several years since 2000.



The Agency for Healthcare Research and Quality and the National Committee for Quality Assurance set performance of a PCI for patients with an acute MI characterized by an ST-segment elevation or left bundle branch

<sup>1</sup> The Montana Hospital Discharge Data System (MHDDS) receives annual de-identified hospital discharge data sets through a memorandum of Agreement with the Montana Hospital Association. Most hospitals in Montana participate in voluntary reporting of discharge data from their Uniform Billing Forms, version 2004 (UB-04). The MHDDS receives information on more than 90% of the inpatient admissions from non-psychiatric facilities in the state; it does not receive data on emergency department visits or outpatient procedures at this time.

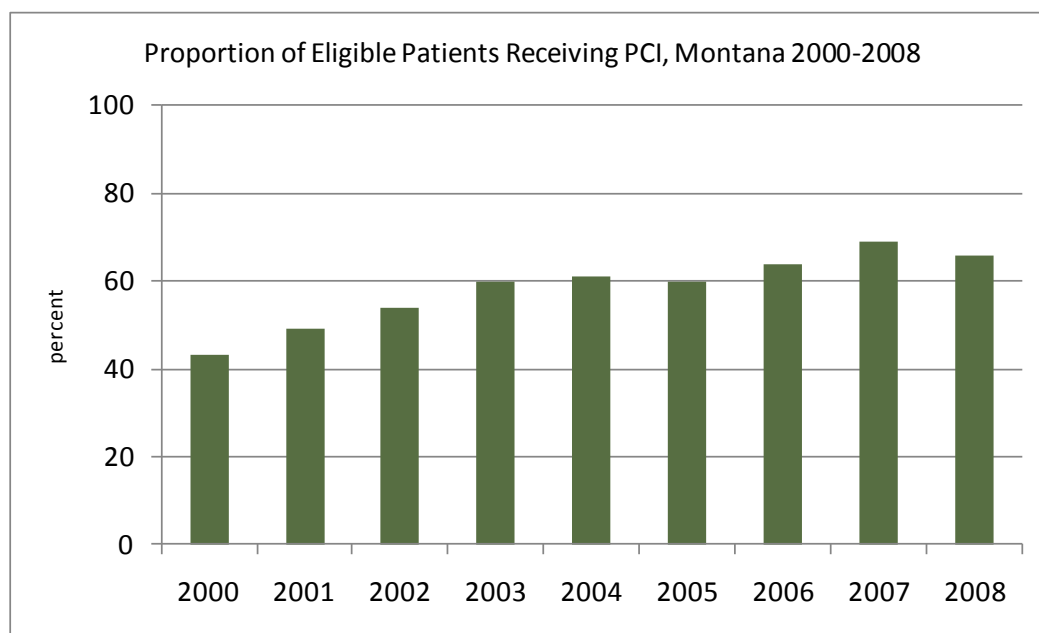
<sup>2</sup> <http://www.dphhs.mt.gov/statisticalinformation/vitalstats/index.shtml>; Heron MP et al, Deaths: Final Data for 2006. National Vital Statistics Reports, vol 57, no 14. Hyattsville, MD: National Center for Health Statistics, 2009.

<sup>3</sup> <http://icd9cm.chrisendres.com/>

<sup>4</sup> Jaber WA et al. 2007. *Med Clin North Amer* 91:751-768.

<sup>5</sup> Andrews, R et al. *Trends in Hospital Risk-Adjusted Mortality for Select Diagnoses and Procedures, 1994-2004*. HCUP Statistical Brief #38. October 2007. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb38.pdf>

block within 90 minutes of admission as a national quality measure of treatment.<sup>6</sup> Nationally, approximately 60% of eligible patients undergo PCI within 90 minutes of admission.<sup>7</sup> The MHDDS data sets contain information on procedures including PCI, although not the timing of those procedures; the data sets also do not contain information on drugs administered. Among Montana patients determined to be eligible for PCI, only 43% underwent PCI in 2000; this proportion increased to 68% in 2007. The increase is probably attributable to a combination of formalization of the AHRQ and HEDIS recommendations in 2003, formalization as Joint Commission on Accreditation of Healthcare Organizations (JCAHO) measure in 2004,<sup>8</sup> and to the extension of PCI capacity to additional hospitals throughout the state.



Montana's low rates of in-hospital mortality from acute MI may reflect a true difference from the national experience, or they may be an artifact of higher mortality rates *prior to* arrival at the hospital. Economic barriers and lack of insurance, female sex, minority race, advanced age, and the existence of serious comorbidities are associated with delay in arrival at the hospital for patients with acute cardiac conditions.<sup>9</sup> In Montana -- a large, rural state -- transport time may be an even greater barrier to obtaining prompt care. Two recent national surveys, using different methodologies, reported that between 79% and 98% of the US population lives less than 60 minutes from urban acute-care hospitals, but that fewer than 50% of residents of the Great Plains and Mountain states live within 60 minutes of such a hospital.<sup>10</sup> Transport times in Montana should be longer than in the US as a whole because Montana is large and a third of the population lives in rural or remote areas.<sup>11</sup> This would seem to place many Montana residents far from PCI-capable hospitals.

Longer transport time and lower in-hospital mortality appear to be contradictory. The MHDDS data sets do not contain information on transport time from event to arrival at the hospital, nor do they contain information on distance to the hospital. Indirect evidence about the impact of death prior to arrival at the hospital is available

<sup>6</sup> [http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc\\_id=14732&strong=AMI](http://www.qualitymeasures.ahrq.gov/summary/summary.aspx?doc_id=14732&strong=AMI); National Committee for Quality Assurance. 2009. *HEDIS 2009 Technical Specifications*. NCQA, Washington, DC.

<sup>7</sup> Rathmore SS et al. 2009. *BMJ* 338:b1807

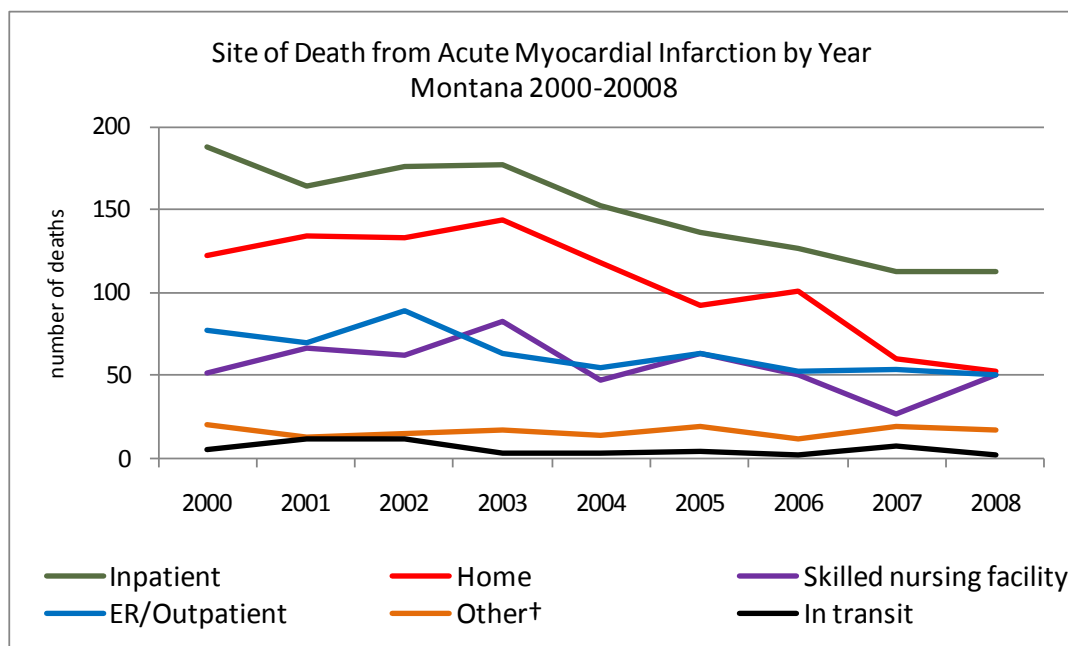
<sup>8</sup> [National Hospital Quality Measures/The Joint Commission Core Measures Joint Commission on Accreditation of Healthcare Organizations](#)

<sup>9</sup> Foraker, RE et al. 2008. *Arch Intern Med* 168:1874-1879.

<sup>10</sup> Nallamothu BK et al. 2010. *Circulation* 113:1189-1195; Carr BG et al. 2009. *Ann Emerg Med* 54:261-269.

<sup>11</sup> [http://ceic.mt.gov/c2000/UA\\_UC/urban\\_rural\\_us\\_sf3.pdf](http://ceic.mt.gov/c2000/UA_UC/urban_rural_us_sf3.pdf)

from death certificates.<sup>12</sup> Total deaths from acute MI (ICD-10 mortality codes I21 and I22)<sup>13,14</sup> have decreased in Montana. The largest declines occurred in inpatient settings and at home. Trends in death occurring in skilled nursing facilities, emergency departments, or other outpatient settings were less consistent but appeared to be declining slightly. Deaths in transit or in other settings were rare and stable over time. The strong decline in acute MI deaths at home and rarity of deaths in transit (1% of such deaths), plus the consistency of deaths in other settings, jointly provide evidence that the decrease in in-hospital mortality rates is real and not an artifact of people not reaching the hospital in time to be saved.



### Conclusions

Montana's in-hospital mortality rates for acute MI compared favorably to national trends and were often significantly lower, despite the potential for long transport times to the hospital and therefore delayed initiation of treatment in Montana. Because mortality in transit was rare in Montana, it cannot account for the lower in-hospital mortality rates, nor can mortality in a variety of other settings. This suggests that Montana's rural critical access hospitals are providing high-quality care to patients with acute MI.

Carol Ballew, PhD  
Lead Epidemiologist / Program Manager  
406-444-6988 [cballew@mt.gov](mailto:cballew@mt.gov)

Please visit our website at <http://www.dphhs.mt.gov/PHSD/MT-HDDS/MTHDDS-index.shtml>

Cody Custis, MS  
Epidemiologist  
406-444-6947 [ccustis@mt.gov](mailto:ccustis@mt.gov)

<sup>12</sup> Access to mortality data was provided courtesy of the Montana Office of Vital Statistics; analysis of these data was conducted by MHDDS staff.

<sup>13</sup> <http://apps.who.int/classifications/apps/icd/icd10online/>

<sup>14</sup> The comparability ratio for acute MI between ICD-9 and ICD-10 is 0.99, suggesting that the difference in coding hospital admissions by ICD-9 and deaths by ICD-10 should have minimal effect on this analysis. Anderson RN et al. 2001. *Comparability of cause of death between ICD-9 and ICD-10: Preliminary estimates*. National vital statistics reports; vol 49 no. 2. Hyattsville, Maryland: National Center for Health Statistics.